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Abstract

Background
Physical activity is an important determinant of health and fitness. This study provides contemporary estimates of the physical activity levels of Canadians aged 6 to 19 years.

Data and methods
Data are from the 2007 to 2009 Canadian Health Measures Survey. The physical activity of a nationally representative sample was measured using accelerometers. Data are presented as time spent in sedentary, light, moderate and vigorous intensity movement, and in steps accumulated per day.

Results
An estimated 9% of boys and 4% of girls accumulate 60 minutes of moderate-to-vigorous physical activity on at least 6 days a week. Regardless of age group, boys are more active than girls. Canadian children and youth spend 8.6 hours per day—62% of their waking hours—in sedentary pursuits. Daily step counts average 12,100 for boys and 10,300 for girls.

Interpretation
Based on objective and robust measures, physical activity levels of Canadian children and youth are low.

Keywords
Actical, pedometer, sedentary behaviour, obesity, public health, motion sensor

Authors
Rachel C. Colley (613-737-7600 ext.4118; rcolley@cheo.on.ca) is with the Children's Hospital of Eastern Ontario Research Institute and the Health Analysis Division at Statistics Canada. Didier Garriguet (613-951-7187; Didier.garriguet@statcan.gc.ca) is with the Health Analysis Division and Janine Clarke is with the Physical Health Measures Division at Statistics Canada. Ian Janssen is with Queen's University. Cora L. Craig is with the Canadian Fitness and Lifestyle Research Institute. Mark Tremblay is with the Children's Hospital of Eastern Ontario Research Institute and the University of Ottawa.

Growing evidence indicates that the health of Canadian children has deteriorated in the past few decades.[1-4] Childhood obesity has risen sharply[5-7]—a quarter of children and youth are now overweight or obese—and physical fitness has declined.[8] Yet paradoxically, according to self-reported data, the majority of Canadian youth are sufficiently active.[9,10] The contrast between current obesity and fitness trends and high levels of self-reported physical activity suggests a need for more objective monitoring of activity levels. The Canadian Health Measures Survey (CHMS) used accelerometers to collect time-sequenced data on physical activity and sedentary behaviour for a nationally representative sample that included children and adolescents aged 6 to 19 years.

Physical activity is associated with health benefits in children and youth,[11] and the more activity, the greater the benefit. Revised guidelines in several countries including Canada[12] recommend that for health benefits, children and adolescents aged 5 to 17 years should accumulate 60 minutes of moderate-to-vigorous physical activity (MVPA) each day.[11,13,14] Evidence also suggests that they should engage in *vigorous* physical activity at least 3 days a week. The accelerometer data from the CHMS make it possible to assess how many Canadian children and youth are attaining these levels.

Sedentary behaviour is associated with obesity and metabolic disease, independent of MVPA[1,15-19] However, measuring sedentary behaviour poses a challenge because it encompasses a broad range of activities (for example, sitting in classrooms, watching TV, talking on the phone, using a computer) that occur intermittently throughout the

day.[20] To date, surveillance has relied on self-reports of screen time, and thereby captured only a portion of total sedentary behaviour. Even so, self-reported screen time is considerable among Canadian youth, at 6 hours a day on weekdays, and more than 7 hours a day on weekends.[1]

Given the large share of time that young people spend in front of screens, an exclusive focus on MVPA is unlikely to substantially increase physical activity at the population level. Measurement approaches and intervention efforts must address both physical activity and sedentary behaviour. Accelerometers are capable of providing robust data to help track trends in both lifestyle choices.

In partnership with the Public Health Agency of Canada and Health Canada, Statistics Canada launched the CHMS in 2007. This article describes levels of accelerometer-measured activity in Canadian children and youth by age, sex and body weight status.

Methods

Data source

The CHMS[21-24] collected data from a nationally representative sample of the population aged 6 to 79 years living in private households at the time of the survey. Residents of Indian Reserves, Crown lands, institutions and certain remote regions, and full-time members of the Canadian Forces were excluded. Approximately 96% of Canadians were represented. The survey involved an interview in the respondent's home and a visit to a mobile examination centre for a series of physical measurements. Data were collected at 15 sites across Canada from March 2007 through February 2009.

Ethics approval to conduct the CHMS was obtained from Health Canada's Research Ethics Board.[22] Informed written consent was obtained from respondents aged 14 years or older. For younger children, a parent or legal guardian provided written consent, in addition to written assent from the child. Participation was voluntary; respondents could opt out of any part of the survey at any time.

The response rate for selected households was 69.6%, meaning that in 69.6% of these households, a resident provided the sex and date of birth of all household members. One or two members of each responding household were chosen to participate in the CHMS; 88.5% of selected 6- to 19-year-olds completed the household questionnaire, and 86.9% of this group participated in the mobile examination centre component. Of the children and youth who agreed to wear the accelerometer and returned the device, 87.4% had at least 1 valid day of data, and 76.3% had at least 4 valid days. After adjusting for the sampling strategy,[23,25] the final response rate for having a minimum of 4 valid days was 40.8% (69.6% x 88.5% x 86.9% x 76.3%). This article is based on 1,608 examination centre respondents aged 6 to 19 years who wore the accelerometer for 4 or more days (Table 1).

Of those who accepted the accelerometer and returned it, 95.4% had at least 1 valid day of data, and 84.8% had at least 4 valid days (Table 2). Adolescents (15 to 19 years) were slightly less likely than younger children to wear the accelerometer for 4 or more days. The mean daily accelerometer wear time for all valid days was 13.6 hours. Wear time was longer among 11- to 19-year-olds than among children aged 6 to 10 years.

Based on age- and sex-specific body mass index (BMI) cut-points adopted by the International Obesity Task Force,[26] children aged 6 to 17 years were classified as: not overweight or obese (including underweight and healthy weight); overweight; or obese. Adolescents aged 18 to 19 years were classified using adult BMI ranges: not overweight or obese (less than 25.0 $kg \cdot m^{-2}$); overweight (25.0 to 29.9 $kg \cdot m^{-2}$); or obese (30 $kg \cdot m^{-2}$ or more).[27,28]

Measurement of physical activity and sedentary behaviour

Upon completion of the mobile examination centre visit, ambulatory respondents were asked to wear an Actical accelerometer (Phillips – Respironics, Oregon, USA) over their right hip on an elasticized belt during their waking hours for 7 days. The Actical (dimensions: 2.8 x 2.7 x 1.0 centimetres; weight: 17 grams) measures and records time-stamped acceleration in all directions, thereby indicating the intensity of physical activity. The digitized values are summed over a user-specified interval of 1 minute, resulting

Table 1
Selected characteristics of weighted sample, by age group and sex, household population aged 6 to 19 years, Canada, March 2007 to February 2009

	Age group (years)					
	6 to 10		11 to 14		15 to 19	
Characteristics	Boys	Girls	Boys	Girls	Boys	Girls
Total sample (number)	369	340	256	248	184	211
Age (years)	8.2	8.1	12.5	12.3	17.0	16.9
Height (cm)	133.9	131.6	158.9	156.9	175.6	166.2
Weight (kg)	32.5	29.9	52.1	50.6	72.4	62.5
BMI (kg/m^2)	17.8	17.0	20.3	20.4	23.4	22.6
BMI category* (%)						
Not overweight/obese	74.4	82.5	72.5	70.5	71.2	79.6
Overweight	17.1[E]	12.6[E]	21.5	23.0[E]	16.4[E]	10.3[E]
Obese	8.1[E]	4.9[E]	6.0[E]	6.5[E]	F	10.1

* International Obesity Task Force classification[26] up to age 17; adult classification used for 18- to 19-year-olds[27,28]
[E] use with caution
F too unreliable to be published
Source: 2007 to 2009 Canadian Health Measures Survey

Table 2
Unweighted distribution of respondents, by valid days of accelerometer wear (10 or more wear hours), age group and sex, household population aged 6 to 19 years, Canada, March 2007 to February 2009

Age group (years)/ Sex	Number of valid days of accelerometer wear									
	0†	1	2	3	4	5	6	7	1 or more	4 or more
	% of respondents									
Total	4.6	2.9	3.6	4.1	8.2	12.7	24.0	39.8	95.4	84.8
6 to 10										
Boys	2.7	2.4	3.2	1.5	6.4	11.5	24.7	47.7	97.3	90.2
Girls	4.2	2.4	2.1	1.8	6.6	13.4	22.1	47.4	95.8	89.5
11 to 14										
Boys	4.4	2.0	1.7	5.1	6.4	11.9	30.5	38.0	95.6	86.8
Girls	3.2	2.8	3.6	2.1	7.8	12.1	23.1	45.2	96.8	88.3
15 to 19										
Boys	9.7	5.4	5.4	8.1	12.8	12.8	20.9	24.8	90.3	71.3
Girls	5.1	2.9	6.9	8.0	11.3	15.0	22.6	28.1	94.9	77.0

† agreed to wear accelerometer, but returned device with no valid data
Source: 2007 to 2009 Canadian Health Measures Survey.

Table 3
Physical activity intensity cut-points for Actical accelerometer[29,30]

Intensity	Activity energy expenditure (kcal· kg^{-1}· min^{-1})	Physical activity ratio (EE/BMR)	Example	Accelerometer count range (counts per minute)
Sedentary	Less than 0.01	Less than 1.5	Car travel, sitting, reclining, standing	Less than 100*
Light	0.01 to less than 0.04	1.5 to less than 3.0	Walking less than 3.2 km/h, light play	100 to less than 1,500
Moderate	0.04 to less than 0.10	3.0 to less than 6.0	Walking more than 3.2 km/h, aerobics	1,500 to less than 6,500
Vigorous	0.10 or more	6.0 or more	Jogging, running	6,500 or more

EE = energy expenditure
BMR = basal metabolic rate
* including wear-time zeros

in a count value per minute (cpm). Accelerometer signals are also recorded as steps per minute. The Actical has been validated to measure physical activity in adults[31] and children,[29,32] and step counts in adults and children.[33]

The Actical has better instrument reliability[34] than other accelerometer models, and its omni-directional capability allows it to capture a wider range of movement than a uni-axial device. The Actical is waterproof, which may help with compliance, as respondents do not have to remove the device so often throughout the day.

The monitors were initialized to start collecting data at midnight following the mobile examination centre appointment. All data were blind to respondents while they wore the device. The monitors were returned to Statistics Canada in a prepaid envelope, where the data were downloaded and the monitor was checked to determine if it was still within the manufacturer's calibration specifications.[35]

Biologically implausible data were assessed to determine whether files should be included in final analyses.[35] Published guidelines were followed to identify and remove days with incomplete (invalid) accelerometer wear time.[35,36] A valid day was defined as 10 or more hours of monitor wear time; respondents with 4 or more valid days were retained for analyses.[36] Wear time was determined by subtracting nonwear time from 24 hours. Nonwear time was defined as at least 60 consecutive minutes of zero counts, with allowance for 1 to 2 minutes of counts between 0 and 100.

Time spent at various levels of movement intensity (sedentary, light, moderate, vigorous) is based on cut-points corresponding to each intensity level (Table 3). Attainment of different physical activity targets was examined:

1. Canadian and World Health Organization (WHO) recommendations: 60 minutes of MVPA daily.[11,13,14] Adherence was defined as the probability of accumulating at least 60 minutes of MVPA at least 6 days a week. Because it is not possible to calculate the probability of accumulating 60 minutes of MVPA on 7 out of 7 days a week, "daily" in the physical activity recommendations is defined as at least 6 days out of a possible 7.
   - The probability of accumulating at least 30, 60 and 90 minutes of MVPA on at least 1, 2, 3, 4 or 5 days a week was also calculated.
   - The probability of accumulating any vigorous physical activity 3 days a week was also calculated.
2. Step-count equivalent of approximately 60 minutes per day of MVPA; that is, 13,500 steps.[37-40] This was calculated as:
   - The percentage with average daily step counts of at least 13,500.[38]
   - The probability of accumulating 13,500 steps a day on at least 6 days a week.

To determine the probability that children and youth accumulate at least 60 (or 30 or 90) minutes of MVPA at least 6 days (or less) a week, the analytical approach was harmonized with that used in the United States to analyze the 2003 to 2004 National Health and Nutritional Examination Survey (NHANES) accelerometry data.[36] To maximize the sample size (important because only 39.8% of the sample aged 6 to 19 years

had 7 valid days of wear), a Bayesian approach was used to incorporate the information from all individuals with 4 or more valid days. An individual's probability of being active at least 6 out of 7 days was estimated using a Beta distribution for its observed combination of active and wear days. The estimated population prevalence is the weighted average of these individual probabilities. Further detail can be obtained elsewhere (http://riskfactor.cancer.gov/tools/nhanes_pam).[41]

Statistical analysis

All analyses were conducted with SAS Version 9.1 and were based on weighted data for respondents with at least 4 valid days. To account for the survey design effects of the CHMS, standard errors, coefficients of variation, and 95% confidence intervals were estimated using the bootstrap technique.[25,42,43] Comparisons of physical activity among age/sex groupings were made with pairwise contrasts. Differences between estimates were tested for statistical significance at $p<0.05$.

Results

Most hours sedentary

Total daily sedentary time for Canadian children and youth averages 8.6 hours (507 minutes for boys; 524 minutes for girls), or 62% of their waking hours. Sedentary time rises with increasing age (Table 4). Another 4 hours a day are spent in light intensity physical activity.

Boys average just over an hour a day (61 minutes) of MVPA, and girls, 47 minutes. Depending on the age group, boys accumulate 11 to 14 more minutes a day of MVPA than do girls. Overweight and obese boys accumulate less MVPA (51 and 44 minutes a day, respectively), compared with boys who are neither overweight nor obese (65 minutes). This gradient is not evident in girls—regardless of their BMI, girls average 44 to 48 minutes of MVPA a day.

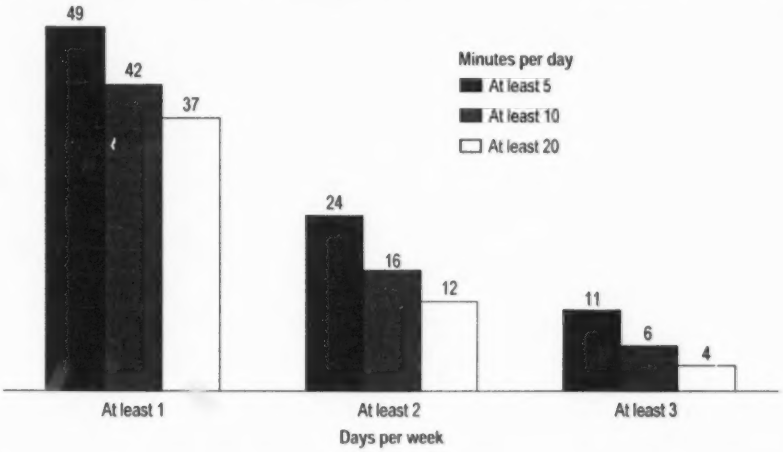
Almost all MVPA (97%) is accumulated at moderate intensity. Around 4% of Canadian children and

Table 4
Average daily minutes of activity at various levels of intensity and average daily step counts, by sex, age group and BMI category, household population aged 6 to 19 years, Canada, March 2007 to February 2009

Sex /Age group/ BMI category	Intensity of activity					Step counts
	Sedentary	Light	Moderate	Vigorous	Moderate-to-vigorous	
	Average minutes per day					Average
Boys	507	260	59*	2	61*	12,121*
Age group (years)						
6 to 10†	445	298	67*	2	69*	13,217
11 to 14	524‡	252‡	58*	2	59*	11,857*
15 to 19	554*‡	230‡	52*‡	1	53*‡	11,267*‡
BMI category						
Not overweight/obese†	500*	262	64*	2	65*	12,584*
Overweight	524	260	50‡	1‡	51‡	11,188‡
Obese	536	248	43‡	<1‡	44‡	10,256
Girls	524	252	46	1	47	10,327
Age group (years)						
6 to 10†	446	306	56	2	58	11,745
11 to 14	527‡	250‡	46‡	2E	47‡	10,351‡
15 to 19	582‡	212‡	38‡	<3	39‡	9,204‡
BMI category						
Not overweight/obese†	524	249	46	2	48	10,224
Overweight	515	262	43	1E	44	10,450
Obese	544	263	47	<3	48	11,159

† reference category
* significantly different from estimate for girls ($p<0.05$)
‡ significantly different from estimate for reference category ($p<0.05$)
E use with caution
Source: 2007 to 2009 Canadian Health Measures Survey.

Figure 1
Percentage with at least 5, 10 and 20 minutes of vigorous physical activity a day, by number of days a week, household population aged 6 to 19 years, Canada, March 2007 to February 2009



Source: 2007 to 2009 Canadian Health Measures Survey.

youth accumulate 20 minutes of vigorous physical activity at least 3 days a week; 6% accumulate 10 minutes; and 11% accumulate 5 minutes (Figure 1).

Moderate-to-vigorous activity

According to results of the CHMS, 7% of Canadian children and youth (9% of boys and 4% of girls) accumulate at least 60 minutes of MVPA at least 6 days a week (Table 5). More than half of boys (53%) and a third (35%) of girls do so at least 3 days a week. The percentages accumulating 60 minutes of MVPA decline with increasing age (Figure 2).

Considerably higher percentages accumulate 30 minutes of MVPA a day: 29% of boys and 21% of girls do so at least 6 days a week. And substantial majorities of both sexes—83% of boys and 73% of girls—accumulate 30 minutes of MVPA at least 3 days a week.

Fewer than 2% children and youth accumulate 90 minutes of MVPA at least 6 days a week. However, 60% do so at least 1 day a week.

Step counts

Boys average 12,100 steps per day, and girls, 10,300 steps (Table 4). At ages 11 to 19 years, boys take more steps than do girls. Adolescents take fewer steps, compared with children aged 6 to 10 years. Overweight boys average significantly fewer steps than boys who are neither overweight nor obese, a relationship that does not exist for girls.

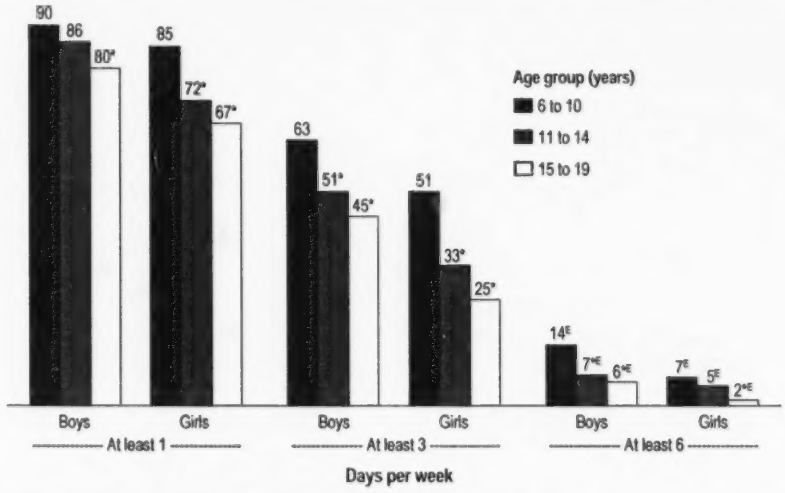
When the sum of step counts is averaged over valid days, 34% of boys and 19% of girls (27% overall) take at least 13,500 steps a day (Table 6). But the percentages accumulating 13,500 steps a day at least 6 days a week are much lower: 7% of boys and 3% of girls (5% overall).

Table 5
Percentage attaining selected physical activity criteria, by sex, household population aged 6 to 19 years, Canada, March 2007 to February 2009

Minutes of moderate-to-vigorous physical activity/Sex	Days active out of 7					
	At least 1	At least 2	At least 3	At least 4	At least 5	At least 6
At least 30						
Total	94.9	87.6	77.7	64.5	47.1	25.3
Boys	96.7*	91.1*	82.6*	70.1*	52.6*	29.0*
Girls	93.1	83.9	72.6	58.4	41.2	21.3
At least 60						
Total	79.8	61.3	44.4	29.3	16.6	6.7
Boys	85.2*	69.5*	52.9*	36.4*	21.5*	9.0*
Girls	73.9	52.6	35.4	21.7	11.3	4.1E
At least 90						
Total	59.8	35.1	20.1	10.7	5.0E	1.7E
Boys	66.3*	42.5*	26.0*	14.7*	7.1*E	2.5*E
Girls	52.9	27.3	13.7	6.5E	2.7E	<2

* significantly different from estimate for girls ($p<0.05$)
E use with caution
Source: 2007 to 2009 Canadian Health Measures Survey.

Figure 2
Percentage with at least 60 minutes of moderate-to-vigorous physical activity on at least 1, 3 or 6 days a week, by age group and sex, household population aged 6 to 19 years, Canada, March 2007 to February 2009



* significantly different from estimate for 6- to 10-year-olds of same sex ($p<0.05$)
E use with caution
Source: 2007 to 2009 Canadian Health Measures Survey.

Discussion

According to WHO and Canadian recommendations, to derive health benefits, children and youth should have at least 60 minutes of MVPA every day.[11,13,14] The CHMS data demonstrate that 7% attain this level of activity. A much higher percentage—44%—have 60 minutes of MVPA at least 3 days a week, which suggests that young Canadians tend to have long within-day sessions of activity rather than shorter episodes spread across more days of the week.

The new recommendations also state that the more physical activity, the greater the health benefit. Very few children and youth (less than 2%) have at least 90 minutes of MVPA on a daily basis. However, 60% attain this level

Table 6
Percentage attaining selected step-count, by age group and sex, household population aged 6 to 19 years, Canada, March 2007 to February 2009

Step count/ Age group (years)	Total	95% confidence interval		Boys	95% confidence interval		Girls	95% confidence interval	
	%	from	to	%	from	to	%	from	to
Average more than 13,500 steps per day									
Total	26.5	17.3	35.7	33.7*	23.1	44.2	18.8[E]	10.0	27.6
6 to 10†	34.0	22.3	45.6	40.2	28.0	52.4	27.0[E]	14.3	39.7
11 to 14	26.8	19.7	33.9	31.3	22.6	40.0	20.7[E]	11.4	30.0
15 to 19	19.4[E]	8.8	30.0	29.5*[E]	13.6	45.4	11.0[‡E]	4.0	18.1
At least 13,500 steps on at least 6 days									
Total	4.8[E]	2.8	6.8	6.7*[E]	4.1	9.2	2.8[E]	1.0	4.5
6 to 10†	7.5[E]	3.4	11.6	9.7[E]	5.2	14.1	<9	...	...
11 to 14	4.6[E]	2.5	6.7	6.1[E]	2.6	9.5	2.7[E]	0.9	4.5
15 to 19	2.4[‡E]	0.8	4.1	4.2*[‡E]	1.4	7.1	<2[‡]	...	...

† reference category
* significantly different from estimate for girls ($p<0.05$)
‡ significantly different from estimate for reference category ($p<0.05$)
[E] use with caution
... not available
Source: 2007 to 2009 Canadian Health Measures Survey.

of activity 1 day a week, which again suggests that MVPA occurs in long, but relatively infrequent, intervals. Analyses of self-reported data from the CHMS household questionnaire might clarify whether respondents with these activity patterns are likely to report participation in physical education classes and/or organized sports. Combining analyses of measured and self-reported data may help target public health interventions.

The guidelines recommend that children and youth have some *vigorous* activity at least 3 days a week,[11,13,14] but do not specify how much. However, according to the CHMS, few accumulate even modest daily amounts; half of children and youth do not have even 5 minutes of vigorous activity on at least 1 day a week. A very small group—fewer than 4%—have 20 minutes of vigorous activity at least 3 days a week. It is possible that vigorous activity is underestimated in this sample because of the relatively high accelerometer cut-point (6,500 cpm), which is based on a single study[29] and is considerably above the cut-point used for adults (3,962 cpm).[44] Research to establish an evidence base for these cut-points is warranted.

Since 2005, the CANPLAY survey has collected pedometer data on a nationally representative sample of children and youth (www.cflri.ca).[45,46] The most recent analysis from that survey indicates that 31% of children and youth take a daily average of at least 13,500 steps,[1,45] similar to the corresponding CHMS figure of 27%. As well, both surveys show that boys take more steps compared with girls, and the number of steps per day declines by about 20% from the youngest to the oldest age group.

The CHMS data show that just under 5% of children and youth take 13,500 steps at least 6 days a week—a result consistent with the 7% value observed in the accelerometer count data for accumulating 60 minutes of MVPA at least 6 days a week. The agreement between the accelerometer and pedometer output is, of course, expected because the data come from the same device.

While the CHMS accelerometer data show that children and youth spend about 8.6 hours a day in sedentary pursuits, these data do not indicate what types of activities the 8.6 hours comprise. Given that other surveys have shown that Canadian youth spend at least 6 hours a day in front of screens,[1] much of the sedentary time identified by the CHMS is likely screen time. What happens during the remaining sedentary hours is less clear. Research combining accelerometer and self-reported data would be helpful in determining contexts in which sedentary behaviour occurs, and thereby, developing strategies and targets for intervention.

In the United States, physical activity was measured by accelerometry (Actigraph, Ft. Walton Beach, FL) as part of the 2003 to 2006 NHANES.[36] While the accelerometer models used in the NHANES and CHMS differed, data reduction and analytical approaches were harmonized,[35] thereby making results somewhat comparable. Canadian children and youth appear to be slightly more sedentary than their American counterparts: 8.6 versus 6 to 8 hours a day.[47] American children aged 6 to 11 years are more likely to accumulate 60 minutes of daily MVPA, compared with Canadian children aged 6 to 10 years. Conversely, Canadians aged 11 to 19 years are more likely than American adolescents to accumulate 60 minutes of daily MVPA. The percentage accumulating at least 60 minutes of MVPA at least 5 days a week is higher among adolescent boys in Canada than in the United States, but similar among adolescent girls in the two countries. Accelerometer data collected on a large sample of children aged 9 to 15 years in England indicate that even fewer (2.5%) accumulate 60 minutes of MVPA a day.[48] Ongoing measurement of physical activity levels in various countries with harmonized methodology will contribute important information to global health surveillance efforts.

Strengths and limitations

The consistency between the CHMS step-count data and findings from the CANPLAY survey (which uses a different type of pedometer) provides validation for both devices. It also suggests that comparisons between accelerometer- and pedometer-measured activity are possible, an important

What is already known on this subject?

- Low levels of physical activity and increased time devoted to sedentary pursuits are associated with childhood obesity.
- Obesity is rising and fitness is declining among Canadian children and youth.
- Yet according to self-reports, the majority of young Canadians are at least moderately active.

What does this study add?

- Boys and girls are sedentary about 8.5 hours a day.
- About 7% of Canadian children and youth accumulate at least 60 minutes of moderate-to-vigorous physical activity (MVPA) at least 6 days a week.
- On average, boys engage in an hour of MVPA per day, and girls, three-quarters of an hour.

finding because both devices will likely continue to be used in the future. A unique advantage of accelerometers is their ability to provide a daily profile of sedentary, light, moderate and vigorous movement. Pedometers are cheaper and have a lower analytical burden, thus allowing larger sample sizes, and in turn, finer breakdowns of results (for example, provincial/territorial). The consistency within direct measurement devices is notable, given the lack of correlation and high bias between self-reported and directly measured physical activity.[49,50]

Because accelerometers and pedometers cannot accurately capture activities that are not step-based, such as swimming and cycling, overall physical activity may be underestimated. As well, accelerometers and pedometers do not measure the added energy expenditure associated with upper body movement, load carrying, or walking up an incline.

The cut-points chosen to delineate sedentary behaviour and light, moderate and vigorous physical activity are based on limited data. Unlike other accelerometer models (for example, the Actigraph), few studies have published cut-points specifically for the Actical.[29-32,51]

The overall CHMS response rate was 40.8%. Although adjustments were made to the sampling weights to compensate, estimates may be biased by systematic differences between respondents and non-respondents. Non-respondents tended to be older, male and more obese, so they might be less active, and the data in this analysis could slightly overestimate physical activity.

Conclusion

Using data from the first cycle of the Canadian Health Measures Survey, this study examines accelerometer-measured physical activity and sedentary behaviour in a nationally representative sample of Canadian children and youth

Physical activity levels are low, with six out of ten waking hours devoted to sedentary pursuits. Persistence of these lifestyle choices among young people could hasten the onset and development of chronic diseases.[5,11] The CHMS data provide a baseline for tracking the effectiveness of interventions and policy initiatives aimed at reversing current trends in obesity and fitness.

Inconsistency between self-reported and directly measured physical activity data[49,50] has made understanding trends difficult.[52] As the number of measurement approaches grows, differences between physical activity outcomes when they are measured by self-report, pedometers, and accelerometers should be examined. One method does not replace another, and the unique strengths and limitations of each must be considered when choosing an analytical approach. ■

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